Ninety-Fifth

Meeting

of

The Electrochemical Society, Inc.

PHILADELPHIA

May 4, 5, 6, and 7, 1949

LOCAL COMMITTEE

General Chairman

ERNEST G. ENCK
Foote Mineral Company
Philadelphia, Pa.

Chairman, Hotel Reservations

RUSSELL P. HEUER
General Refractories Company

Chairman, Meeting Accommodations

JOHN F. GALL
Pennsylvania Salt Mfg. Co.

Chairman, Registration

EDGAR L. ECKFELDT
Leeds & Northrup Co.

Chairman, Finance

HIRAM S. LUKENS
University of Pennsylvania

Chairman, Entertainment

HARRY A. ALSENTZER
University of Pennsylvania

Chairman, Plant Visits

MILTON B. BARBA
Leeds & Northrup Co.

Chairman, Publicity

ALBERT A. WARE
Ware Bros. Company

Ninety-Fifth Meeting

Wednesday through Saturday

May 4, 5, 6, and 7.

GENERAL INFORMATION

Convention Headquarters will be at **The Benjamin Franklin Hotel,** Chestnut Street at Ninth Street. The registration desk and all meeting rooms will be on the mezzanine floor.

Rates for rooms will be: Single rooms $5.00 to $6.50; Double rooms with double bed, $7.00 to $8.50; Double rooms with twin beds, $9.00 to $10.00; Suites of living room, twin bed room, and bath, $15.00 and $20.00.

Requests for room reservations should be made to O. V. Cleaver, The Benjamin Franklin Hotel, Chestnut Street at Ninth, Philadelphia 5, Pa.

REGISTRATION

Registration of members and guests will begin at 7:00 P.M. on Wednesday, May 4th. The registration desk will be open daily from 8:00 A.M. to 5:00 P.M. throughout Thursday and Friday, and from 8:00 A.M. until 10:30 A.M. on Saturday.

The registration fees through Wednesday, Thursday or Friday are:

Members	$6.00	Ladies	$3.00
Non-members	8.00	Students	2.00

On Saturday, the fee for Members, Non-members, and Ladies will be $2.00, and for Students $1.00.

Advance registrations will be accepted. They should be sent with check to Edgar L. Eckfeldt, % Leeds & Northrup Co., 4901 Stenton Avenue, Philadelphia 44, Pa.

ANNUAL BUSINESS MEETING

The Annual Business Meeting of the Society will be held Thursday, May 5th, at 8:45 A.M. in the Betsy Ross Room.

LUNCHEONS AND DINNERS

Thursday Luncheon

This will be held in the Ballroom at 12:30 P.M. Mr. James A. Lee, President of The Electrochemical Society, will be the luncheon speaker, and will discuss the present policies and aims of the Society.

Thursday Evening Reception and Banquet

A reception for President and Mrs. Lee will be held at 6:15 P.M. in the Betsy Ross Room. Following the reception, the Convention Dinner will be held at 7:00 P.M. in the Ballroom. Following the dinner, the Young Author's Prize and the Turner Book Prize will be awarded by President Lee. Finally, Mr. Lee will deliver his Presidential Address. At the conclusion of these ceremonies, the Local Committee has arranged for dancing and tables for cards. Refreshment facilities will be conveniently available in the Franklin Room.

Friday Luncheon

This will be held in the Ballroom at 12:30 P.M. This will be a group luncheon for the various divisions, and is an excellent opportunity for those interested to meet other members of their division. Seating arrangements will provide for segregation of the various divisions.

Friday Supper and Entertainment

The Friday supper will be held at 7:30 P.M. in the Ballroom. Immediately following the supper, there will be informal entertainment provided by the Local Committee and fun for all by participation in a Tombola. Refreshment facilities will be conveniently available from 6:45 P.M. until 12:00 M. in the Foyer.

No special arrangements have been made for a luncheon on Saturday, and members and guests will be free to make individual plans.

LADIES' PROGRAM

A full program is planned for the ladies, consisting of:

Thursday: Reception and get-together 11:00 o'clock A.M., followed by luncheon in the Garden Terrace of the Benjamin Franklin Hotel. After luncheon they will visit the famous Philadelphia Art Museum. Above is complimentary as guests of the Philadelphia Section to all ladies who are registered.

Friday: An all-day trip is planned to Longwood Gardens, the famous gardens of Pierre S. du Pont (see LIFE magazine, March 7, 1949, pages 76 to 80). Lunch provided. The only charge for this all-day trip will be $2.50 for transportation.

PLANT TRIPS

The program includes two trips of special interest to electrochemists. These trips are scheduled for Friday morning and afternoon.

Friday Morning, 9:00 A.M., leaving time; Benjamin Franklin Hotel, Leeds & Northrup Co. Plant and Laboratories.

Friday Afternoon, 2:00 P.M., leaving time; Benjamin Franklin Hotel, Whitemarsh Research Laboratories of Pennsylvania Salt Manufacturing Company; and Regional Research Laboratories of U.S.D.A.

Buses will be provided and will leave hotel at designated times. As the trips are limited to a maximum of 80 for each visit, advance registration will be needed. Charge for each trip, $1.50.

ANNUAL BUSINESS MEETINGS OF DIVISIONS

Industrial Electrolytic Division—will hold its annual business meeting and election of officers for the coming year at 1:15 P.M., Saturday. Place will be announced.

Electronics Division—Annual business meeting and election of officers will be held at the Divisional Luncheon on Friday, May 6th, in the Crystal Ballroom.

Electrothermic Division—will hold its annual business meeting and election of officers on Saturday, May 7th, at 9:00 A.M. in the Franklin Room.

COST OF VARIOUS FUNCTIONS

(other than registration)

Thursday Luncheon (Men)	$2.75
Thursday Luncheon and Trip (Ladies)	FREE
Thursday Banquet and Reception	7.00
Friday Plant Trips—	
A.M.	1.50
P.M.	1.50
Friday Luncheon (Men)	2.75
Friday Trip and Luncheon (Ladies)	2.50
Friday Supper and Entertainment	4.50

(Gratuities are included in the above costs)

DETAILED PROGRAM

Wednesday, May 4, 1949

10:00 A.M.—Meeting of Constitution and By-Laws Committee, Independence Room.

10:30 A.M.—Joint Meeting of Publication Committee and Editorial Staff, Franklin Room.

11:30 A.M.—Meeting of Division By-Laws Committee, Independence Room.

1:30 P.M.—Meeting of Local Section Advisory Committee, Independence Room.

3:00 P.M.—Meeting of Ways and Means Committee, Franklin Room.

7:30 P.M.—Meeting of the Board of Directors, Franklin Room.

Thursday—Section A

TECHNICAL SESSION SCHEDULE

Meetings	Thursday A.M.	Thursday P.M.	Friday A.M.	Friday P.M.	Saturday A.M.	Saturday P.M.
General	A	A				
Luminescence	B	B	B	B		
Rare Metals			A	A		A
Theoretical					B	B
Industrial Electrolytic Round Table					C	
Electrothermic Round Table					A	

A—Section A in Betsy Ross Room.
B—Section B in Crystal Ballroom.
C—Section C in Franklin Room.

TECHNICAL PROGRAM

Thursday, May 5, 1949

SECTION A—MORNING SESSION
BETSY ROSS ROOM

(Note that Section B—Symposium on Luminescence will begin at 9:30 A.M. in the Crystal Ballroom and will be held simultaneously with Section A. Succeeding sessions will also be held in parallel.)

GENERAL SESSION

with President James A. Lee presiding

9:15 A.M.—Formal opening of the 95th Convention with Introduction by General Chairman Ernest G. Enck and response by President Lee.

9:30—H. deWet Erasmus and J. A. Persson, Union Carbide and Carbon Research Lab., Niagara Falls, N. Y. "The Preparation and Properties of Silicon Monoxide"

A friable, massive, black, resinous material satisfying the chemical formula for silicon monoxide has been made by the controlled condensation of vapors obtained by heating silicon and silica in a vacuum. The material is completely soluble in hydrofluoric acid, is an electric insulator, and is structurally different from either silicon or silica.

10:00—D. Schlain, J. D. Prater, and S. F. Ravitz, U. S. Bureau of Mines, Salt Lake City, Utah. "Electrolytic Refining of Antimony Bullion"

Antimony bullion of several compositions was electrolytically refined in electrolyte composed of antimony trifluoride and sulfuric acid at current densities up to 20 amp./ft.^{2} (2.2 amp./dm.^{2}). The effects of electrolyte circulation and of variation in the antimony content of the electrolyte were studied.

Thursday—Section A

10:30—J. L. Gabbard and M. R. Thompson, U. S. Bureau of Mines, Electrotechnical Lab., Norris, Tenn. "The Effect of Sodium Hydroxide upon the Electrodeposition of Electrodialyzed Kaolin"

Fractions of electrodialyzed Georgia kaolin of definite particle size range were prepared by centrifugation and employed to make suspensions for obtaining pH titration curves. Using partially neutralized suspensions from the pH measurements, the corresponding yield in g./coulomb upon electrodeposition was determined.

The yield of clay varied with the kind of metal employed as anode.

11:00—G. C. Ware, H. E. Blake, Jr., and K. B. Higbie, U. S. Bureau of Mines, Albany, Ore. "The Electrodeposition of Zinc on Zinc Starting Sheets"

Zinc starting sheets have been successfully operated as cathodes in purified solutions under conditions which approximate those found in the low-current density electrolytic zinc plants. These cathodes have been carried in residence as long as 39 days with a resulting thickness of 2.6 in.

11:30-12:30—J. H. Simons and Coworkers, H. T. Francis, J. A. Hogg, W. J. Harland, W. H. Pearlson, T. J. Brice, W. A. Wilson and R. D. Dresdner, Pennsylvania State College, State College, Pa. "The Electrochemical Process for the Production of Fluorocarbons"

A direct electrochemical method for the preparation of fluorocarbons in which elementary fluorine is neither produced nor employed is described in the five parts of this article. An electric current is passed through cells containing a solution of HF and an organic compound.

12:30 P.M.—Recess for lunch.

2:00 P.M.—R. B. Mears, Carnegie-Illinois Steel Corp., Pittsburgh, Pa. "A Unified Mechanism of Passivity and Inhibition"

A unified mechanism of passivity based on the behavior of local elements in metal surfaces is developed. It is suggested that passivity may be achieved either by (a) reduction of the open circuit potential differences between the local anodes and cathodes, (b) increased anodic polarization, (c) increased cathodic polarization, or (d) a combination of these factors.

2:30—W. A. Wesley and H. R. Copson, International Nickel Co., Bayonne, N. J. "Effect of Non-condensable Gases on Corrosion of Nickel in Steam Condensate"

The corrosive conditions to which chemical evaporator tubes may be exposed on the steam side were simulated and showed that appreciable corrosion of nickel can occur in a critical range of composition of the noncondensable gases, namely, from about 55 to 90% carbon dioxide by volume.

Thursday—Section A

3:00—M. E. Straumanis and N. Brakšs, University of Missouri, Rolla, Mo. "The Rate of Solution of Highest Purity Aluminum in Sodium Hydroxide Solutions"

A series of dissolution experiments on highest purity aluminum (99.998%) in NaOH solutions ranging from 0.1 to 5*N* has showed that the rate of solution in NaOH up to 0.5*N* is proportional to the cube root of the concentration, and in the region between 0.5 and 3*N* increases in proportion to the concentration.

3:30—S. Yamaguchi, T. Nakayama, and T. Katsurai, Scientific Research Institute Ltd., Tokyo, Japan. "Electron Diffraction Studies on the Anti-Corrosive Nature of Stainless Steel"

Electron diffraction measurements made of surface films produced on 18 per cent Cr-4 per cent Ni and 19 per cent Cr-9 per cent Ni stainless steels indicate their composition to be a solid solution of (Ni,Fe) CrO_4.

3:40—J. J. Lander, Naval Research Lab., Washington, D. C. "The Basic Sulfates of Lead"

The formulas for the basic sulfates of lead for melts of PbO and $PbSO_4$ show the compounds: $PbSO_4 \cdot 4PbO$, $PbSO_4 \cdot 2PbO$, and $PbSO_4 \cdot PbO$. A wet method of preparation leads to the compounds: $PbSO_4 \cdot 4PbO$, $PbSO_4 \cdot PbO$, and a hydrous compound tentatively assigned the formula: $PbSO_4 \cdot 3PbO \cdot H_2O$. X-ray methods of analysis support these formulas.

4:10—B. Werbel and W. C. Vosburgh, Duke University, Durham, N. C. "Polarization in Various Electrode Systems"

Measurements were made of the variation of electrode potential of various electrode systems with the current passed. The electrode systems were mainly cathode systems in which the oxidizing agent was of limited solubility, but a few were systems with soluble reactants and products for reference.

SECTION B—THURSDAY

CRYSTAL BALLROOM

Symposium on Luminescence with Dr. H. C. Froelich presiding

9:30 A.M.—Opening remarks by President James A. Lee and Division Chairman E. G. Widell.

9:35—Introductory Address by Dr. G. R. Fonda.

9:45—A. L. Smith, RCA, Lancaster, Pa. "Some New Complex Silicate Phosphors Containing Calcium, Magnesium, and Beryllium"

The simple silicates of Group II metals have long been known as phosphor bases. It has been established here that under certain conditions of preparation $CaMg(SiO_3)_2$:Ti is the most efficient blue-

emitting silicate under cathode-ray excitation now known. When cerium III is used as an activator in this material, a highly efficient phosphor emitting mainly in the ultra-violet region is obtained. Another complex silicate of unusual properties is $CaO{\cdot}BeO{\cdot}SiO_2$:Mn.

10:15—E. Makai, United Incandescent Lamp and Electrical Co. Ltd., Budapest, Hungary. "High Valency Manganese as Activator of Luminescence"

It was inferred from the analysis of the emission spectra of Mn-activated zinc orthosilicate and zinc beryllium silicate phosphors, and from the extinction spectra of aqueous solutions of $KMnO_4$ and K_2MnO_4, that the luminescence centers of these phosphors are essentially permanganate and manganate ions, respectively. In addition, it is shown that several properties of various Mn-activated phosphors can be explained with the assumption that their luminescent centers have MnO_4^- or MnO_4^{2-}-like configurations.

10:35—H. G. Jenkins, A. H. McKeag, and P. W. Ranby, General Electric Co. Ltd., Wembley, England. "The Halophosphates: A New Class of Phosphors for Fluorescent Lamps"

The authors describe a class of new phosphors of great technical importance, which enable white light to be obtained from a single chemical compound. These new materials are of halo phosphate composition activated by antimony and manganese.

11:05—S. Jones, General Electric Co., Cleveland, Ohio. "An Alumina-Lithia-Iron Oxide Phosphor"

A phosphor containing alumina, lithia, and iron oxide is described. It is efficiently excited by 2537 Angstrom radiation, emitting a band spectrum with its energy peak at 6800Å and half its peak energy intensity at 6520 and 7320Å. The fluorescent is enhanced by silica.

11:20—Five minute stretch.

11:25—H. C. Froelich, General Electric Co., Cleveland, Ohio. "Double and Triple Activated Magnesium Pyrophosphate Phosphors"

Magnesium pyrophosphate, double activated with cerium and thorium, has been developed as an ultraviolet emitting phosphor having considerably greater powder brightness than standard 360 BL phosphor. The peak of emission occurred between 3440 and 3560Å, depending upon concentration of activators, as compared with 3600Å for 360 BL.

11:55—J. H. Schulman, R. J. Ginther, and E. W. Claffy, Naval Research Laboratory, Washington D. C., "Luminescence of $(Zn, Be)_2 GeO_4$: Mn Phosphors"

It is well known that the luminescence emission of divalent-manganese activated phosphors is restricted to the spectral range of green through red. Two hypotheses have been advanced to account for

the effect of the host crystal on the color of the manganese emission within this range. A study of the $(Zn, Be)_2GeO_4$:Mn system was undertaken in order to find evidence in favor of one or the other of these viewpoints.

12:30 P.M.—Recess for Lunch.

2:00 P.M.—C. G. A. Hill and H. A. Klasens, Philips Electrical Ltd., Surrey, England. "The Influence of Temperatures on the Efficiencies of Zinc Sulphide Phosphors Containing Silver and Cobalt"

The temperature dependence of the blue fluorescence of zinc sulphide phosphors containing 10^{-2}% silver and $0\text{-}10^{-3}$% cobalt, under λ 3650 excitation, have been measured over the temperature range 120°-600°K. The form of the temperature dependence curve and its shift toward lower temperatures on the introduction of cobalt are interpreted in terms of the theory of the hole migration.

2:30—F. A. Kroeger and J. E. Hellingman, Philips Research Laboratories, Eindhoven, Holland. "Chemical Proof of the Presence of Chlorine in Blue Fluorescent Zinc Sulfide"

Chemical determinations of the chlorine present in phosphors support a previously enunciated theory of blue centers.

2:45—E. Banks, H. I. Yakel, and R. Ward, Polytechnic Institute of Brooklyn, Brooklyn, N. Y. "Luminescence and Conduction in Solid Solutions of Rare Earth Sulfides in Alkaline Earth Sulfides"

A study of the solid solubility of cerium and samarium sulfides in strontium sulfide has shown a marked dependence of the limit of solubility on the firing atmosphere. The difference in solubility upon heating the mixtures in different atmospheres may be due to the presence of traces of oxygen or moisture in the nitrogen, which have been shown to be capable of converting Ce_2S_3 into cerium (III) oxysulfide, Ce_2O_2S.

3:15—N. T. Melamed, Polytechnic Institute of Brooklyn, Brooklyn, N. Y. "An Investigation of Zinc Sulfide Infrared Quenching Phosphors"

A series of experiments were carried out on zinc sulfide and zinc cadmium sulfide quenching phosphors in an attempt to derive some information regarding the mechanism of infrared quenching. The quenching activators used were Mn, Fe, Ni and Co. Cu and Ag were used as primary activators.

3:45—R. Nagy, R. G. Wollentin, and C. K. Lui, Westinghouse Electric Corp., Bloomfield, N. J. "Ultraviolet Emitting Phosphor"

A calcium zinc phosphate phosphor activated with thallium has been developed for the generation of ultraviolet radiation and is especially rich in erythemal region. The peak of emission of this phosphor is dependent upon the ratio of the calcium to zinc.

Thursday—Section B

4:05—Five minute stretch.

4:10—G. R. Fonda, General Electric Co., Schenectady, N. Y. "The Constitution of Zinc Beryllium Silicate Phosphors and Its Effect on Their Luminous Properties"

The limit of solubility of beryllium in zinc silicate at 1260°C. was found to be at about 25 molar % for phosphors containing 2.5% manganese as well as for unactivated products. Maintenance of phosphors in lamps was somewhat better for a composition slightly higher in beryllia than corresponded to the saturation point. The initial rate of decay of phosphorescence is exponential.

4:40—E. F. Lowry, Sylvania Electric Products, Inc., Salem, Mass. "The Long-Term Deterioration in Certain Phosphors Exposed to Mercury Resonance Radiation"

An expression for the decay in lumen efficiency of phosphors exposed to a mercury vapor discharge has been developed. It turns out that this expression is of the form commonly associated with first order chemical reactions and this permits one to speculate on the phenomena responsible for the decay.

5:10—M. Sadowsky, Lansdale Tube Company, Lansdale, Pa. "The Preparation of Luminescent Screens"

The various methods used in the preparation of luminescent screens are discussed and evaluated. The evaluations are made on the basis of the relative importance of such factors as luminescence efficiency, uniformity, thickness, coverage, texture, color, contrast, secondary emission, current saturation, and facility of deposition.

(Note—Symposium on Luminescence continues Friday, May 6, at 9:00 A. M.)

FRIDAY, MAY 6, 1949

SECTION A, BETSY ROSS ROOM

Symposium on Rare Metals
with Mr. Ernest G. Enck presiding

9:00 A.M.—J. E. Booge, E. I. du Pont de Nemours & Co., Wilmington, Del. "Recent Developments in Titanium"

Titanium is assuming an increasing importance as a potentially valuable material of construction. Relatively light, with good strength and attractive corrosion resistance, it may some day fill the present structural gap between aluminum and alloy steel.

9:30—L. E. Netherton and M. L. Holt, University of Wisconsin, Madison, Wisconsin. "Electrodeposition of Rhenium from Aqueous Solutions"

A study of the electrodeposition of rhenium from aqueous plating baths, with emphasis on semi-

quantitative information about cathode current efficiencies, is reported. Although rhenium can be plated as a shiny metallic and adherent cathode deposit from several different types of aqueous baths, it was found that cathode current efficiencies were quite low ranging from about 15% to less than 1%. The sulfuric acid bath was found to be the most satisfactory rhenium plating bath. A new citric acid type of plating bath for rhenium is also described.

10:00—I. E. Campbell, C. F. Powell, and B. W. Gonser, Battelle Memorial Institute, Columbus, Ohio. "The Formation of Refractory Coatings by Vapor-Deposition Methods"

Conditions for preparing refractory metals, carbides, borides, silicides, nitrides, and oxides by vapor deposition techniques are outlined. This is a general review article introducing what it is hoped will be a comprehensive series of articles on the formation of the various classes of coatings.

10:30—I. E. Campbell, V. D. Barth, and B. W. Gonser, Battelle Memorial Institute, Columbus, Ohio. "Chromizing in Fused-Salt Baths"

A review of a systematic laboratory-scale investigation of the influence of temperature, bath composition, treating time, and testing atmosphere on the chromizing of various steels is presented. Rates of case formation are presented in graphical and mathematical form.

11:00—W. J. Kroll and H. L. Gilbert, Bureau of Mines, Albany, Ore. "Melting and Casting of Zirconium Metal"

The methods for melting and casting zirconium are described and reference is made to the manner of heating, furnace design, and crucible materials.

11:30—E. A. Gulbransen and K. Andrew, Westinghouse Research Lab., East Pittsburgh, Pa. "Reactions of Zirconium, Titanium, Columbium, and Tantalum With the Gases Oxygen, Nitrogen, and Hydrogen at Elevated Temperatures"

A systematic study is made of the kinetics of the reactions including a study of the time, temperature, and pressure variables. The reaction rates are studied by the vacuum microbalance method and the surface structures by the electron diffraction method. The data are correlated with fundamental diffusion and solution processes and diffusion constants and energies of activation are calculated.

12:00—E. T. Hayes and A. H. Robertson, Bureau of Mines, Albany, Ore. "Some Effects of Heating Zirconium in Air, Oxygen and Nitrogen"

Zirconium metal was heated in nitrogen, oxygen, and air at temperatures ranging from 425° to 1300°C. Nitrogen diffuses into zirconium at a much slower rate than oxygen. A marked increase in absorption of both gases was found near 900°C., and this is evidently associated with the all-tropic transformation from hexagonal to cubic form.

12:30 P.M.—Recess for lunch.

Friday—Section A

Symposium on Rare Metals (cont'd)
Semi-conductors
with Dr. John Musgrave presiding

2:00 P.M.—L. W. Strock, E. J. Clugston, and W. P. Henderson, Saratoga Labs., Saratoga Springs, N. Y. "The Geochemical Distribution of Some Rare Metals and Present Status of their Commercial Exploitation"

The geochemistry of the rare elements Ge, Ga, In, Be, Tl, Rb, Se, and Te will be outlined. In view of the current scientific and commercial interest in Ge for electronic and other instruments, the abundance of Ge in the earth's crust will be stressed. The discovery of new sources of rare metals in low grade ores by spectrographic prospecting will be illustrated in the case of Be. The recovery of rare metals from by-products of plants, processing ores containing very small amounts of rare metals, will be illustrated for Ge and Ga, even though there is a limited supply of a high grade mineral of these two metals.

2:30—J. H. Scaff and H. C. Theuerer, Bell Telephone Labs., Murray Hill, N. J. "The Role of Impurities in Germanium for Rectifiers and Transistors"

Experiments relating impurity additions with the electrical properties of germanium have been carried out because impurities affect both the rectification and the amplification properties. These show that aluminum, gallium, and indium additions result in P-type germanium while arsenic and antimony additions result in N-type germanium. Pure tin has little or no effect on the electrical properties. If, however, impure grades of tin are used, substantial effects are observed.

3:00—K. Lark-Horovitz and R. M. Whaley, Purdue University, Lafayette, Ind. "The Preparation of Pure Germanium and Its Semi-conducting Alloys"

Pure germanium has about 60 ohm-cm. intrinsic resistivity at room temperature, corresponding to about 10^{14} carriers per cm.^{3}; homogeneous material of about 20 ohm-cm. has been produced and in some samples regions of intrinsic resistivity have been found. Additions release one carrier per ionized impurity atom and it has been shown that additions from the column B, Al, Ga, In produce P-type alloys whereas additions from the column N, P, As, Sb, Bi produce N-type alloys.

3:30—F. C. Mathers, H. C. Gatos, G. W. Leonard, Jr., Mrs. M. L. Reid, and Mrs. L. D. Schaffer, Indiana University, Bloomington, Ind. "Preparation of Telluric Acid by Oxidation of Tellurium Dioxide with Hydrogen Peroxide in Ammonium Hydroxide Solution"

Hydrogen peroxide is a better oxidizing agent than chromic acid, permanganate, chloric acid, etc. for preparing telluric acid from tellurium dioxide because no inorganic by-product is left that would make purification of the telluric acid difficult.

4:00—V. E. Bottom and K. Lark-Horovitz, Purdue University, Lafayette, Ind. "The Preparation of Pure Tellurium"

Tellurium, one of the few elementary semi-conductors, has seldom been prepared in highly pure form. Since the electrical and mechanical properties of semi-conductors are strongly dependent on very small amounts of impurities, it is of interest to obtain them in the most nearly pure state. By repeated fractional distillation, tellurium has been prepared in which the ratio of the number of current carriers to the number of tellurium atoms is $\sim 1/10^6$ (compared with $\sim 1/10^3$ in C.P. material).

4:30—D. W. Lyon, C. M. Olson and E. D. Lewis, E. I. du Pont de Nemours & Co., Wilmington, Del. "Preparation of Hyper-Pure Silicon"

(Note—Symposium on Rare Metals continues Saturday, May 7, at 2:00 P. M.)

FRIDAY, MAY 6, 1949

SECTION B—CRYSTAL BALLROOM

Symposium on Luminescence (cont'd) with Dr. E. F. Lowry presiding

9:00 A.M.—A. H. McKeag and P. W. Ranby, General Electric Co. Ltd., Wembley, England. "New ZnS Phosphors Activated by Phosphors"

The present paper describes a new series of zinc sulphide phosphors in which the activator is the non-metal phosphorus. This gives a range of fluorescent colors varying from blue to yellow as the phosphorous content is increased. The method of firing also markedly affects the color.

9:20—W. H. Byler and G. P. Kirkpatrick, U. S. Radium Corp., New York, N. Y. "On the Decay of Phosphorescence and the Mechanism of Luminescence of Zinc Sulfide Phosphors"

The decay of phosphorescence of some representative types of zinc sulfide phosphors has been measured. When $I^{-0.5}$ is plotted against t, a series of straight lines is obtained. It is concluded that zinc sulfide phosphors generally obey the second order decay law and that the separate straight lines correspond to emptying of electrons from different trap levels with different rate constants.

9:50—A. P. Rice, Tottenham Lamp Works, London, England. "Differential Thermal Analysis Studies in Some Silicate Systems"

The method of differential thermal analysis has been applied to the qualitative study of the reaction processes in the formation of some zinc silicate phosphors. Heating curves are given showing how the various reactions may be identified, and illustrating the effects of small additions of beryllium, manganese and potassium compounds.

10:10—G. F. J. Garlick and D. E. Mason, University of Birmingham, Birmingham, England. "Electron Traps and Infrared Stimulation of Phosphors"

Extensive studies have been made of the relation between electron trap distributions, as shown by thermoluminescence experiments, and the infrared stimulation characteristics of phosphors. A large number of conventional zinc and alkaline earth sulfide phosphors, as well as the special types of infrared sensitive phosphors, have been investigated.

10:40—Five minute stretch.

10:45—K. H. Butler, Sylvania Electric Products, Inc., Salem, Mass. "The Fluorescence of Silicate Phosphors. III. Application of Potential Energy Curves"

The fluorescence of silicate phosphors is discussed on the basis of a potential energy curve model and it is shown that Gaussian distributions of the energy bands in excitation and emission spectra can be expected from this model. The model is applied to manganese activated phosphors and an attempt is made to explain the long decay time of these phosphors. Lead activated silicates are discussed and reasons for assuming divalent lead to be the activator are brought out.

11:15—J. T. Anderson and R. W. Wells, B. T. H. Co., Rugby, England. "Two New 'Red' Phosphors"

A short account is given of the preparation and luminescent spectral emissions of Zinc Barium Silicate Mn, and Aluminum Phosphate Sn Mn. Both these phosphors can give spectra with high red content under 2357 Å radiation.

11:30—J. E. Underwood, Diamond Alkali Co., Painesville, Ohio. "An Anomalous Luminescent Effect"

The luminescence caused by the radiations emitted from radon, when confined over a plane surface of phosphorescent zinc sulfide, is not uniform. Bright and dark areas occur in a variety of unpredictable configurations and these areas slowly change their form and light intensity with time.

11:45—J. Ewles, University of Leeds, England. Topic to be announced.

12:15 P.M.—Recess for Lunch.

1:45—K. Lange, New York Medical College, Flower and Fifth Avenue Hospitals, New York, N. Y. "The Use of Fluorescent Dyes as Tracers in Biology and Medicine"

This paper describes the use of fluorescent tracers in biology and medicine. Fluorescin is injected intravenously and its appearance in various tissues is observed under illumination with ultraviolet light. The technique of the method and its applications to diagnosis are described.

Friday—Section B

2:10—W. H. Kohl, Collins Radio Co., Cedar Rapids, Iowa. "Further Remarks on 'A New Method for the Application of Luminescent Screens to Glass Surfaces' "

The process described (Can. Jour. Res. A.13.126-132, 1935) was subsequently developed further and its mechanism elucidated. It refers to the deposition, on the inside wall of the tube to be coated, of a sulfurous deposit of the type $(S_2O_3)x$ which is obtained from burning CS_2 in the presence of water vapor and a catalyst.

2:30—S. L. Parsons and A. E. Martin, Sylvania Electric Products, Inc., Flushing, N. Y. "Recording Spectroradiometers for Luminescent Materials"

Instrumentation programs for the careful measurement of spectral energy distributions emitted by luminescent materials have proved important in research activities. A pair of automatic recording spectroradiometers developed for the manufacturing control of phosphors is described.

3:00—H. P. Rooksby and A. H. McKeag, General Electric Company Ltd., Wembley, England. "X-rays in the Development of Inorganic Phosphors"

X-ray examination of inorganic phosphors is directed to the evaluation of several different characteristics. Besides identification, x-ray examination shows that the development and maintenance of crystalline perfection has an important bearing on the achievement of high luminescent efficiency. X-rays have been used to study the manner in which impurity activators dissolve in the matrix substance of which the phosphors are composed.

3:30—L. Villemey, The University, Lyon, France. "The Relationship between Fluorescence and the Nature of Substituants in Acridone"

3:45—F. A. Kroeger, J. Th. G. Overbeek, J. Goorissen, and J. van den Boomgaard, Philips Research Labs., Eindhoven, Holland. "Bismuth as an Activator in Fluorescent Solids"

Trivalent bismuth forms centers of fluorescence both in its own compounds and in other systems in which it is present as an activator. The fluorescence consists of various bands between the ultraviolet and the red. The proportion between these bands depends on the lattice and on the temperature of observation. Sulfates and phosphates of the alkaline earth group show a predominantly red fluorescence. The red fluorescence in $Ca_2P_2O_7$-Bi shows the remarkable feature that is temperature-dependence is different for excitation by cathode rays and for x-rays.

4:00 to 6:00—Round Table Discussion on Luminescence.

SATURDAY, MAY 7, 1949

SECTION A, BETSY ROSS ROOM

9:00 A.M.—Round Table Discussion under auspices of the Electrothermic Division on subject "Special Melting Techniques for Metals." The moderator will be Nathan E. Promisel, Head, Materials Branch, Bureau of Aeronautics, Navy Department, Washington, D. C. A panel of experts on arc, induction, and resistance melting, vacuum equipment, refractories, electrodes, miscellaneous melting methods and equipment will be on hand to discuss specialized subjects.

SATURDAY, MAY 7, 1949

SECTION B, CRYSTAL BALLROOM

Symposium on Theoretical Electrochemistry with Professor George Glockler presiding

9:00 A.M.—Victor K. La Mer, Columbia University, New York, N. Y. "Monodisperse Colloids and Higher Order Tyndall Spectra"

When supersaturated vapors are cooled under carefully regulated conditions of temperature control and addition of foreign nuclii, it is possible to produce a monodisperse aerosol, that is one in which the radii of the particles are sensibly uniform. By mixing equal quantities of dilute aqueous HCl (0.006M) and $Na_2S_2O_3$ (0.002M) the production of sulfur is so slow and uniform that a very monodispersed hydrosol is formed. The growth of the particles of these sols can be stopped and stabilized at a given size by the addition of iodine.

Such monodispersed colloids exhibit a new optical effect—Higher Order Tyndall Spectra—which is characterized by red and green bands (up to 9 in number) and distributed in angle depending upon the size of the particles. The Rayleigh scattering is the Zeroth Order spectrum. These spectra permit the rapid and accurate measurement of the radius and number of particles. By use of such methods the kinetics of the formation and growth of these colloids has been studied. Practical applications to screening smoke fogs and insecticidal aerosols will be discussed. A theory for their formation will be given.

9:30—K. Sollner, U. S. Public Health Service, Bethesda, Md. "Some Recent Work on the Electrochemistry of Membranes"

The importance of membranes in the biological sciences and in physical chemistry alike is due to their twofold character. On the one hand, membranes are restrictive barriers which selectively influence the transportation and the exchange, by diffusion or otherwise, of the various molecular species contained in the two compartments which are separated by the membrane; on the other hand, membranes, by virtue of their being barriers, act also as physicochemical machines which regulate

the flow of the energetic processes occurring across their thickness and, in doing this, transform various forms of energy into others, e.g., osmotic energy into electrical energy or into mechanical work.

A short outline is given of recently developed methods for the preparation of electronegative, selectivity cation permeable and of electropositive, selectively anion permeable membranes of various degrees of porosity. Electronegative and electropositive membranes can be prepared now, for instance, which behave in concentration chains virtually like ideal reversible machines for the transfer of cations and ions respectively.

10:00—K. G. Stern and M. Reiner, Polytechnic Institute of Brooklyn, Brooklyn, N. Y. "Boundary Anomalies and Artifacts in Electrophoresis"

The discussion will deal with the anomalies inherent in the dissymetry of the ascending and descending boundaries, with stationary boundary anomalies and interaction phenomena as well as electrophoretic boundary spreading. Artifacts due to convective and electrical disturbances will be analyzed and the behavior and detection of false or spurious boundaries will be discussed. Finally, the various means of establishing starting boundaries will be described and the properties of these boundaries will be examined critically with particular reference to their bearing on studies of the electrophoresis and diffusion of proteins.

10:30—H. A. Abramson, M.D., New York, N. Y. "Application of Electrophoresis to Allergy"

Data of theoretical and clinical importance will be presented relating to the properties of electrophoretically purified pollen extracts; the electrophoresis of allergens into the human skin in relation to the therapy of hay fever and asthma; the electrophoresis of histamine through the skin and in relation to the histamine theory of allergy; and the value of general electrophoretic therapy in asthma and multiple sclerosis.

11:00—R. Edelberg and F. Hazel, University of Pennsylvania, Philadelphia, Pa. "Streaming Potential Measurements with Phosphors"

Streaming potentials of phosphor surfaces and of pyrex glass surfaces have been determined with the aid of non-polarizable electrodes under conditions which promote varying degrees of adhesion of phosphor to glass. The materials and reagents were commercial products employed in the manufacture of television screens. Zeta potentials of the solid surfaces were calculated from the streaming potential data.

11:20—E. L. Eckfeldt and G. A. Perley, Leeds & Northrup Co., Philadelphia, Pa. "The Measurement of and Effect of Temperature on the Electrical Resistance of Glass Electrodes"

The apparent irregularities observed in measuring the electrical resistance of glass electrodes as reported in the literature are explained by the dielectric properties of glass. The use of d.c. is recommended, and the need for caution is indicated in the use of a.c. An experimental technique is described which hastens the measurement with d.c. when dielectric absorption is bothersome. An experimental study is described dealing with the

effect of temperature on the resistance of several groups of glass electrodes, including ones of Corning 015 and three newer pH-responsive glasses.

11:40—A. Walkley and A. D. Wadsley, Council for Scientific and Industrial Research, Melbourne, Australia. "Some Observations on the Potential of the Manganese Dioxide Electrode"

The potential of the system of the manganese dioxide electrode has been determined with the object of obtaining the standard potential of the MnO_2-manganous ion couple in acid solution. Some electrodes gave values close to those obtained by previous workers and to the thermodynamically calculated value of 1.23 volts.

12:00—Carl Wagner, Ordnance Res. & Dev. Div., Fort Bliss, Texas. "The Role of Natural Convection in Electrolytic Processes"

It is shown both theoretically and experimentally that at a vertical electrode a well-defined convective flow due to the generally smaller density in the boundary layer and the resulting buoyancy force exists, analogous to natural convection in the case of heat transfer from a radiator to ambient air.

12:30 P.M.—Recess for lunch.

2:00 P.M.—L. B. Rogers and J. C. Griess, Jr., Massachusetts Institute of Technology, Cambridge, Mass. "A Study of the Separation of a Trace of Silver from a Macro Amount of Palladium by Electrolysis"

A study was made of the electroseparation of silver and palladium using several complexing agents. Cyanide was found to produce the most favorable separation while, at the same time, allowing a nearly complete recovery of silver.

2:20—L. B. Rogers and A. F. Stehney, M. I. T., Cambridge, Mass. "The Electrodeposition Behavior of a Simple Ion"

The electrodeposition behavior of a trace on an inert electrode can be described by the unabridged form of the Nernst equation after it has been modified by the addition of a term to account for energy differences at the deposit-electrode interface.

2:40—L. B. Rogers, D. P. Krause, J. C. Griess, Jr., and D. B. Ehrlinger, M. I. T., Cambridge, Mass. "Electrodeposition Behavior of Traces of Silver"

By means of radioactivity, the extent of silver deposition on platinum cathodes was determined at various potentials under conditions closely approaching equilibrium.

3:00—H. J. McDonald, R. D. Misch and R. B. Bernstein, Illinois Institute of Technology, Chicago, Ill. "Influence of Surface Films on the Electrodeposition of Hydrogen on Palladium"

Saturday—Section B

Experiments are reported in which the presence of various surface films is shown to influence the process of H discharge on a Pd cathode. At constant current density, the steady-state hydrogen diffusion rate through a hollow Pd cathode was found to be a function of the nature and thickness of the adsorbed film.

3:20—P. A. Geary and J. G. Miller, University of Pennsylvania, Philadelphia, Pa. "Solvent Effect on the Electric Moment of Some Amines"

The electrical moments of a series of sympathomimetic amines were larger in benzene than in dioxane. The results are discussed in terms of intermolecular and intramolecular bonding, solute-solvent association, solute-solute association, and field effect.

3:40—G. Glockler and J. W. Sausville, State University of Iowa, Iowa City, Iowa. "Thermionic Emission from Carbon"

Measurements of the work function of carbon have yielded the value 4.35 ± 0.06 e.v. The constant A of the Richardson equation was found to be 48 ± 25 amp./cm.^{2}/deg.^{2} These results are in accordance with the latest values reported in the literature.

4:00—G. Glockler and J. W. Sausville, State University of Iowa, Iowa City, Iowa. "The Electron Affinity of the Carbon Atom"

The electron affinity of the carbon atom is estimated to be 2.2 e.v. from linear extrapolation of the ionization potentials of the isoelectronic sequence C^-, N, O^+, F^{++}, and Ne^{+++}. Experimentally it is shown that a carbon filament above 1850°K. gives off negative ions under proper conditions.

SATURDAY, MAY 7, 1949

SECTION C, FRANKLIN ROOM

9:15 A.M.—Round Table Discussion under auspices of the Industrial Electrolytic Division. "Materials of Construction for Chlor-Alkali Plants"

The subject will be discussed both from the standpoint of the requirements of the process and that of the properties of suitable materials. Well-known authorities from leading companies operating such plants will give ten-minute talks to open the discussion. Recently developed materials which might serve to combat corrosion will be discussed.

TYPEWRITTEN DISCUSSION

Members and guests wishing to present written discussion on any of the papers listed in this program will please submit three copies of each to the Secretary of the Society, 235 West 102nd Street, New York 25, N. Y.

SATURDAY, MAY 7, 1949

SECTION A, BETSY ROSS ROOM

Symposium on Rare Metals
with Mr. Ernest G. Enck presiding

2:00 P.M.—H. J. Seim and M. L. Holt, University of Wisconsin, Madison, Wis. "A Contribution to the Electrochemistry of Tantalum"

The various methods for the electrodeposition of tantalum from aqueous and non-aqueous solutions which are recorded in the literature are reviewed and examined critically and found unsuccessful.

2:30—H. E. Kremers, Lindsay Light & Power Co., West Chicago, Ill. "The Rare Earth Industry"

The industrial extraction of cerium and other rare earths from monazite sand is reviewed briefly, and the principal uses of the rare earths are discussed.

3:00—E. M. Wise, International Nickel Co., Inc., New York, N. Y. "Platinum Metals"

A few of the milestones in the development of methods of processing and uses of the platinum metals are indicated. Substantial quantities of platinum and palladium are used for jewelry, but industrial uses are more important.

3:30—A. B. Chandler, Foote Mineral Co., Philadelphia, Pa. "Spectrographic Analysis of Lithium and Sodium in Solid and Liquid Samples"

A technique for the spectrochemical analysis of lithium and sodium bearing materials, both solid and liquid samples, is presented. It consists of fusion of the sample with $KHSO_4$ using proper dilution to bring percentage Li_2O and Na_2O into the range 0.1% to 1.0%, grinding to fine powder, and burning a weighed sample in a d.c. arc interrupted by a rotating magnet mounted at right angles to the arc column.

4:00—C. G. Fink and J. S. Smatko, Columbia University, New York, N. Y. "Electrochemical Production of Uranium Boride, UB_2, A New Abrasive"

A method of treating pitchblende ore has been devised, which yields uranium nitrate of an exceptionally high purity. Very pure UO_3 of constant properties can be prepared readily and in large quantities from pure uranyl nitrate solutions. A method was devised to prepare uranium diboride in a high state of purity and at reasonably good current efficiency by the electrolysis of molten uranium-containing borate baths. UB_2 is the hardest man-made substance and possesses other favorable properties, such as high chemical reactivity, high melting point (2365°C.), and good electrical conductivity.

4:30—Adjournment.

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FALL MEETING

at the

LASALLE HOTEL

Chicago, Illinois

October 12, 13, 14, and 15, 1949

SESSIONS ON

Corrosion

Electrodeposition

Organic Electrochemistry

Manuscripts for the Fall Meeting are due at the Secretary's Office, 235 West 102nd Street, New York 25, N. Y.

not later than June 15, 1949.

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